

TRADITIONAL METHODS OF BUCKWHEAT (*FAGOPYRUM ESCULENTUM* MOENCH) CULTIVATION IN HIGH ALTITUDES COLD DESERT REGION OF INDIA (LADAKH)

PHUNTSOG TUNDUP¹, M. A. WANI², SHABBER HUSSAIN³, SONAM DAWA⁴ & TSEWANG TAMCHOS⁵

^{1, 5}, Dihar, Drdo C/O 56apo

²Division of Soil Science, ³Division of Fruit Science, ⁴Division of Floriculture and Landscape Architecture, Sher-e-Kashmir, University of Agricultural Sciences and Technology of Kashmir, Shalimar, Jammu and Kashmir India

ABSTRACT

Buckwheat is the most important life support, multi-purpose and nutritious crop of the tribes living in the Cold desert. It is the only crop grown up to 4500 m elevation. *Fagopyrum esculentum* and *F. tataricum* are the two species cultivated in the Himalayas. Currently the cultivation and production of buckwheat is declining. In some of the areas, it has been completely replaced due to change in land use pattern for quick economic gains. Generally, one ploughing, single weeding and 4-6 times irrigations were required for the crop. On the basis of average over three locations, Himpriya gave the highest yield of 13.8 q/ha, but the farmers used local types and got an average yield of 10-12 q/ha. The most intensive cultivation areas have been identified for on farm conservation and participatory plant breeding to raise its production, highlighting the future exploration and conservation needs.

KEYWORDS: Buckwheat, Cold Desert, Ploughing, Weeding & Yield

Received: Nov 13, 2016; **Accepted:** Dec 26, 2016; **Published:** Dec 29, 2016; **Paper Id.:** IJASRFEB201713

INTRODUCTION

The distribution of Buckwheat (*Fagopyrum esculentum* Moench) has been reported from the states of Sikkim, Meghalaya, Arunachal Pradesh in the Northeastern Region and Ladakh region of Jammu and Kashmir state. The crop seeds (strictly achenes) are usually classified as pseudocereal and are cultivated at lower altitudes in Ladakh i.e. Khaltsi block of Leh and almost all villages of Kargil district (Figure 1). The peoples of Ladakh region of Jammu and Kashmir use the grain as a staple food since rice cannot be grown at this altitude due to physiological problems. The grain is generally used as human food, animal/poultry feed, cover crop and the flour used in the preparation of pancakes, chapattis, noodles, cereals etc. Buckwheat noodles are a typical delicacy in Japan and are even served on Japanese international airlines. In some areas *Chang*, a local beer made from Tartary buckwheat, demands a higher price because of its medicinal effects (Campbell, 1997). Joshi and Paroda (1991) mentioned that this crop helps in soil binding and checks soil erosion. Buckwheat is one of the important and nutritious crops of the mountain regions and it is the only crop, which can be grown up to 4500 m (Joshi and Paroda, 1991). The crop possesses a high lysine content, which is an important amino acid for human health (Anonymous, 1979). The tender leaves (Figure 2) are utilized as a leafy vegetable in the region of the country. Rutin is used as a medicinal agent for the treatment of vascular disorders. Tartary buckwheat

(*F. tataricum*) is a very rich source for *rutin* as compared to common buckwheat (*F. esculentum*) (Kitabayashi et al., 1995). Biochemical analysis on the protein and phosphorus percentage of different genotypes of this crop is being carried out at Chaudhury Charan Singh Haryana Agricultural University (CCSHAU), Hissar under the All India Coordinated Research Project (AICRP) on Under Utilized Crops.

MATERIALS AND METHODS

The Ladakh region is one of the most elevated (2900 m to 5900 m asl) and coldest region (-30°C to -70°C) of the earth and lies between $31^{\circ} 44' 57''$ to $32^{\circ} 59' 57''$ N latitude and $76^{\circ} 46' 29''$ to $80^{\circ} 41' 34''$ E longitude. There are buckwheat growing areas namely Skurbuchan, Achinathang, Domkhar, Dha-Beema, Bogdang and Turtuk in Leh district and nearly all villages in Kargil district, which are low laying areas and located near L.O.C which remains land locked for more than six months in a year. The villages falls in Leh district were located around the famous river Indus. Similarly, the villages of Kargil district were inhabited near the Indus and Suru River which ultimately flows in Pakistan.

The survey on the traditional production technologies of underexplored buckwheat was conducted in Leh and Kargil district of J&K. Four villages from Leh district (Skurbuchan, Achinathang, Domkhar, Dha-Beema) and most of the villages of Kargil district were purposively selected and the investigations were made through multiple field visits, questionnaires and interviews with elderly people regarding the cultivation practices of buckwheat in the cold desert region.

RESULTS AND DISCUSSIONS

The details of the present investigation carried out to study the production technologies of buckwheat in high altitude cold desert zones are presented hereunder.

Climate and Land Preparation

Buckwheat is cool weather crop and thrives best in cool moist climate. Buckwheat is a fast growing crop (2 months, 18 days) and prefers a moist cool climate in a well-drained sandy loam soil, however, it can also be grown very well in slightly gravels soil as well. In Ladakh regions of India, buckwheat is growing on the terraced fields after the harvesting of Barley or the first main crop. Farmers in this region are not applying any manure or fertilizer to this crop.

Sowing Time, Methods and Depth

The sowing time of buckwheat depends on agro climatic conditions. In the low altitude areas of Ladakh, the sowing time is first fortnight of July. The seed is scattered or sown via broadcasting method and plough the soil in order to mixed the seed with soil or sowing behind the plough (pora method) (Sharma and Mir, 2000). No other improved technique of sowing is followed in this region. The seeding rate varies from 30-35 kg per hectare for a grain crop. Thinning may start after 20 days from sowing if needed. The effective sowing depth of a variety depends on coleoptiles length of its seed. In cold desert Ladakh, moisture is rapidly depleted from upper surface of soil, so seed must be well placed inside for uniform germination. Hence, optimum sowing depth is 5.0cm (Sharma and Mir, 2000).

Development and Use of Varieties

Two varieties, namely Himpriya (NBPGR, Shimla) and VL-7 (VPKAS, Almora) have been released. *Himpriya* has been recommended for cultivation in the high Himalayas, whereas *VL-7* has been recommended for

cultivation in the foot and mid hills of India. The yield potential of *Himpriya*, after 7 years of testing at three locations was 12.6 q/ha. Whereas VL-7 had a grain yield 9 q/ha (Joshi, 1999). Apart from these two varieties, the ladakhi farmers are still cultivating local types. These local types can be further improved through participatory plant breeding involving farming communities.

Irrigation and Weeding

The buckwheat growing area of the Ladakh region is normally in an irrigated situation via the glacier water. Irrigation should be given according to the season and to the demand of the crop. Generally, irrigations are given at an interval of 12-16 days and 4-6 times irrigated with glacial water (Figure 3). The crop grows rapidly and covers the soil very fast. In buckwheat, the higher seed rate is generally used to promote faster canopy development and higher population for better weed control. The crop emerges usually within 4-5 days. Buckwheat plants that produce a good canopy are very good competitors for weeds and generally smother them out. However, if the weeds are more, one weeding at 12-15 DAS is helpful in raising a good crop (Figure 4).

Lodging

Anti-lodging practice is very much required to support the plant because of its heavy branching and weak stems. Lodging is dependent on the plant population and on gaps between the plants. Therefore, in buckwheat it is recommended that plant population should be high enough that yield should not be reduced due to lodging (Figure 5).

Manuring

Under Indian conditions, 50 kg nitrogen, 20 kg P_2O_5 and 40 kg K_2O or 1500-2000 kg Farm Yard Manure (FYM) per hectare have been recommended to produce higher yields (Phogat and Sharma, 2000). However, in Ladakh, the farmers do not apply any manures to this succeeding crop.

Disease and Pest

Buckwheat is normally a cold tolerant crop and is not attacked by diseases or pests.

Harvesting and Threshing

The harvesting time of buckwheat also varies a little due to different agro-ecological conditions. The crop is harvested in the second fortnight of September in lower areas of Leh district and first week of October in Kargil district. If the harvest is delayed, seeds can shatter due to wind or be dispersed due to invading living organisms (birds, rats etc.). Due to its gradual formation and maturity of seeds, harvesting is done periodically and finally the crop is pull out of the soil and left for 2-3 days so that seeds are fully matured. Threshing is done via hitting with a wooden stick and then winnowing in order to separate the seed with dust and other waste particles (Figure 6). The seeds must be well dried before storage (Figure 7). Over matured seeds when come in contact with high moisture, germinate quickly as the seeds have vivipary characteristics.

Yield

The yield varies from 10-12 quintals per hectare.

Future Needs

- Screening of germ plasm for frost resistance and selection of short duration varieties should be carried out to allow production in high mountain where growing period is limited for 2 to 3 months due to early winter and snow fall.
- Cultivation of buckwheat should be encouraged, instead of millets and other crops to check soil erosion.
- Buckwheat cultivation promotes improved soil texture and increases production of fallow crops.
- Buckwheat is the most suitable crop for marginal and degraded lands and is also important for crop diversification in the foot hills of the Himalayas.
- It is important to promote ancient nutritive food crops like buckwheat for various health reasons.
- Buckwheat cultivation in the cold desert region should be encouraged as it does not require high input technology and can be raised with lower management costs in marginal and degraded lands on a sustainable basis.
- Introduction of exotic germ plasm, particularly large seeded, early maturing types to fit in areas having a short growing period.

CONCLUSIONS

There are a lot of advantages and scope to grow this crop in the cold desert region. At high altitudes in Jammu and Kashmir, the crop is used as a staple food, where cereal crops like rice cannot be grown due to extreme low temperature. The prevailing agro-ecological condition of the region is very suitable to producing such an under-utilized crop as buckwheat. Cultural practices to grow this crop are simple and economical. To maintain the large and dense population, a higher seeding rate is necessary and can be used to prevent lodging. Sowing time is very important to produce this crop effectively and susceptibility to diseases and pest is less important due to cool climate during the growing season. Local farmers need to advance to improved seed varieties like *Himpriya*, so as to get a good yield. There is a need to undertake scientific improvement work of buckwheat for increasing its production and on farm conservation to benefit the poor and marginal farmers of the cold desert.

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APPENDICES

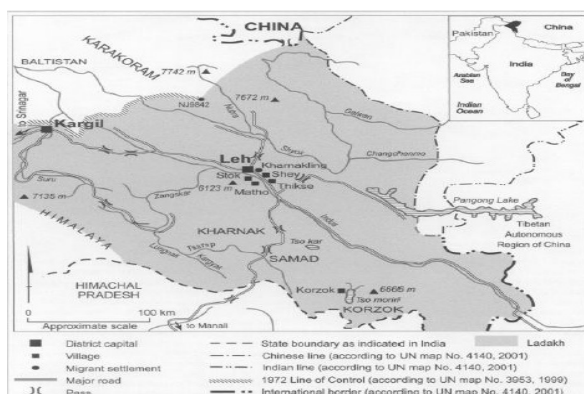


Figure 1: Map of Study Area



Figure 2: Buckwheat in Full Bloom



Figure 3: Farmer Irrigating her Buckwheat Field



Figure 4: Weeding by Farmers via a Special Local Tool “*purcha*”



Figure 5: Dense Plant Population at Early Stage



Figure 6: Winnowing of Threshed Buckwheat



Figure 7: Buckwheat Seed